Notice of Allowability	Application No.	Applicant(s)	
	10/613,327	KINZER ET AL.	
	Examiner	Art Unit	
	Pamela E. Perkins	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the filing of the after final amendment on 22 February 2005*.

2. ☒ The allowed claim(s) is/are *1-10*.

3. ☒ The drawings filed on *07 July 2003* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

DETAILED ACTION

This office action is in response to the filing of the after-final amendment on 22 February 2005. Claims 1-10 are pending.

Allowable Subject Matter

Claims 1-10 are allowed.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance: prior art does not anticipate, teach, or suggest a process for the manufacture of a substrate for a superjunction device where a first epitaxial semiconductor layer of a given thickness and of a given impurity concentration of a first conductivity type is only formed atop a support body; forming a plurality of spaced implants of a second conductivity type on the surface of the first epitaxial layer; forming only a second epitaxial layer of a given thickness and of a given concentration and of the first conductivity type atop the first epitaxial layer; and thereafter heating the substrate and the implants to cause the implants to diffuse downwardly into the first epitaxial layer and upwardly into the second epitaxial layer, thereby forming spaced pedestals of the second conductivity type within the first and second epitaxial layers; the total charge of each of the pedestals being approximately equal to the total charge in the volume of the first and second epitaxial layers which surrounds the pedestals, wherein the first epitaxial semiconductor layer and the second epitaxial semiconductor layer together form a single epitaxial layer, and wherein the pedestals are formed near a central region of the single epitaxial layer spaced from the support body.

For example, Onishi et al. (6,611,021) disclose a process for the manufacture of a substrate for a superjunction device where a first epitaxial semiconductor layer of a given thickness and of a given impurity concentration of a first conductivity type is formed atop a support body; forming a plurality of laterally spaced implants of a second conductivity type on the surface of the first epitaxial layer; forming a second epitaxial layer of a given thickness and of a given concentration and of the first conductivity type atop the first layer; heating the substrate and the implants to cause the implants to diffuse downwardly into the first layer and upwardly into the second layer, thereby forming spaced pedestals of the second conductivity type within the first and second layers; and thereafter forming MOSgated cell elements atop each of the pedestals.

However, Onishi et al. do not disclose, anticipate, teach, or suggest the total charge of each of the pedestals being approximately equal to the total charge in the volume of the first and second epitaxial layers which surrounds the pedestals; and wherein the pedestals are spaced from the support body.

Gardener et al. (6,204,153) disclose a process for the manufacture of a substrate for a semiconductor device where a first epitaxial semiconductor layer of a given thickness and of a given impurity concentration of a first conductivity type is formed atop a support body; forming a second epitaxial layer of a given thickness and of a given concentration and of the first conductivity type atop the first layer; forming an implant on the surface of the first layer, wherein the implant is spaced from the support body; and thereafter forming a MOSgated cell element atop of the implant.

However, Gardener et al. do not disclose, anticipate, teach or suggest forming a plurality of spaced implants of a second conductivity type on the surface of the first epitaxial layer; the total charge of each of the pedestals being approximately equal to the total charge in the volume of the first and second epitaxial layers which surrounds the pedestals, wherein the first epitaxial semiconductor layer and the second epitaxial semiconductor layer together form a single epitaxial layer, and wherein the pedestals are formed near a central region of the single epitaxial layer.

The prior art made of record in this action does not anticipate, teach, or suggest a process for the manufacture of a substrate for a superjunction device where a first epitaxial semiconductor layer of a given thickness and of a given impurity concentration of a first conductivity type is only formed atop a support body; forming a plurality of spaced implants of a second conductivity type on the surface of the first epitaxial layer; forming only a second epitaxial layer of a given thickness and of a given concentration and of the first conductivity type atop the first epitaxial layer; and thereafter heating the substrate and the implants to cause the implants to diffuse downwardly into the first epitaxial layer and upwardly into the second epitaxial layer, thereby forming spaced pedestals of the second conductivity type within the first and second epitaxial layers; the total charge of each of the pedestals being approximately equal to the total charge in the volume of the first and second epitaxial layers which surrounds the pedestals, wherein the first epitaxial semiconductor layer and the second epitaxial semiconductor layer together form a single epitaxial layer, and wherein the pedestals are formed near a central region of the single epitaxial layer spaced from the support body.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Pamela E. Perkins whose telephone number is (571) 272-1840. The examiner can normally be reached on Monday thru Friday, 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
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PEP